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A Solution to Textile Waste: Using an Inorganic Molten Salt Hydrate as a Cellulose Solvent for Textile Recycling

The purpose of the presentation is to present an innovative process to valorize post-consumer cellulose-based textile waste using an inorganic molten salt hydrate. The particular molten salt hydrate is a strong cellulose solvent, resembling the properties and behavior of ionic liquids. This has allowed us, Lund University and ShareTex, to dissolve cellulose-based textile waste and subsequently produce a novel cellulose fiber through spinning, made from 100% postconsumer waste. The molten salt hydrate also exhibits hydrolytic activity at elevated temperatures, which can be exploited to carefully target specific degrees of polymerization of the cellulose by adjusting the temperature during the dissolution. Regardless of the specific degree of polymerization (DP) of the raw material, the process can thus be tailored to produce fibers with precise properties. However, as the DP can only be adjusted downward via this process, cellulosic waste textiles with a very low DP could be unsuitable for fiber-to-fiber recycling. Instead, treating such textiles with the molten salt hydrate and precipitating the cellulose before completed dissolution renders a dissolving pulp. This dissolving pulp could then replace pulp from primary sources, such as wood pulp. In fact, dissolving pulp produced this way had such high quality that we managed to produce high-quality viscose fibers using it as raw material in the viscose process. These combined applications for the same solvent system illustrate the adaptability and robustness of using this inorganic molten salt hydrate as a cellulose solvent for the valorization of cellulose-based waste textiles in textile recycling.